

Problems Of Environmental Biosafety in Its Parasitic Pollution

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Abstract. The profound civilizational shift of recent decades has increased the anthropogenic impact on the biosphere and complicated the environmental situation. Human impacts on the environment lead to a sharp disruption of the evolutionarily established balance of ecosystems at different levels, including parasitic ones. Parasitic systems in modern farming conditions respond to external influences with a complex of reactions, a significant part of which are unstudied. This problem relates to the field of ecology and combines theoretical and practical aspects of solving the problem of environmental biosafety during parasitic contamination.

Key words: helminths, ecology, risk groups, children, soil pollution, contamination, larvae, prevention.

Relevance. Currently, the spread of parasitic diseases is a pressing problem for all of humanity. According to the World Health Organization, about 5 billion people in the world are affected by protozoal diseases and helminthiasis, i.e. the overwhelming majority of the inhabitants of our planet. At the same time, according to WHO experts, helminthiasis have now to some extent become “forgotten diseases” - there is an underestimation of their medical and social significance throughout the world. The consequence of destabilization of parasitic systems is parasitic pollution of the environment [1], in which helminths play a leading role. Parasitic pollution is expressed in an increase in the parameters of infection of people and animals, infestation of previously unusual helminth species, and in the intensive contamination of environmental objects with propagative stages of helminth development [2]. In the current situation, monitoring helminthic contamination of territories is of great importance for making forecasts, tracking trends in changes in pollution parameters in order to adequately respond in the course of managing the situation [3].

The WHO Director-General, at a meeting on parasitic infection control held in Geneva on 29-30 November 2004, noted that more than two billion people in the world suffer from diseases associated with intestinal parasites. The negative impact of diseases caused by parasites on the health and social development of society is comparable to the impact of diseases such as tuberculosis, malaria and HIV/AIDS. It was noted that the main risk group for such diseases are children of school and younger ages [8, 9, 10].

The World Bank estimates that the economic cost of intestinal helminthiasis, the most common parasitic disease, is fourth in the list of costs of treating all diseases and injuries; the incidence of helminthiasis is comparable to the incidence of acute respiratory viral infections and influenza [5, 6].

The importance of climatic and geographical features in the spread of helminthiasis in the Fergana region: children’s constant residence in closed children’s groups, constant contact with domestic animals, contact with the earth (living in rural areas, playing in the sand, etc.), frequent travel to exotic countries, passion for hunting and fishing [7].

The purpose of the work is to identify the specifics of the formation and biological diversity of helminth fauna complexes to assess the level of environmental biosafety in the Fergana region.

Materials and methods. Scientific research was carried out in the period 2021-2022. The objects of study were agricultural (cows, sheep, goats, horses), domestic carnivorous (dogs, cats) animals, and the soil of the territories of populated areas in the region. Statistical data on helminth damage to animals was obtained from livestock farms in settlements of the Fergana region and from the Fergana regional veterinary laboratory. Statistics on the prevalence of helminths among the population were obtained from the Fergana Regional Sanitary and Epidemiological Welfare and the Department of Public Health.

Results. Helminthiasis is one of the most common diseases in Uzbekistan, accounting for more than 90% of the total number of parasitic diseases. The level of long-term infection in the population remains stably

high. Every year, more than 200 thousand infected people are registered in the country. As can be seen from Table 1, the prevalence of helminths varies by region.

Table 1

City, district	Years	Number of subjects	incl. children under 14 years old	Number of identified patients		incl. children up to 14 years old	
				Total	%	Total	%
Fergana	2022	46302	32964	1351	2,9	1202	3,6
	2021	35626	24893	2 028	5,7	1914	7,6
Kokand	2022	83113	60849	3296	3,90	3151	5,1
	2021	64904	46588	2499	3,8	2273	4,8
Margilan	2022	42218	21445	1530	3,6	1469	6,8
	2021	40584	22315	1339	3,2	1302	5,8
Kuvasay	2022	32947	20332	427	1,3	382	1,9
	2021	32418	19044	591	1,8	518	2,7
Altiarik	2022	50137	33004	4251	8,4	3815	11,5
	2021	42496	22067	3457	8,1	2782	12,6
Kushtepa	2022	20131	12248	1003	5,0	946	7,7
	2021	17744	13525	1 010	5,6	822	6,0
Baghdad	2022	56727	47893	2475	4,4	2470	5,1
	2021	41405	28247	2336	5,6	2336	8,3
Besharik	2022	42969	28883	3317	7,7	3280	11,3
	2021	32335	20547	2684	8,3	2592	12,6
Buwayda	2022	55549	40894	1129	2,0	992	2,4
	2021	53512	41148	1756	3,2	1647	3,0
Dangara	2022	38021	29381	1537	4,0	1523	5,2
	2021	28210	19778	1476	5,2	1465	7,4
Kuva	2022	31707	29447	1540	4,8	1508	5,1
	2021	36710	34042	2778	7,6	2690	7,9
Rishtan	2022	23832	19505	2618	11	2485	12,7
	2021	25785	22173	3082	11,9	2945	13,3
Soh	2022	10575	4830	1130	10,7	1081	22,4
	2021	7857	2850	867	11	819	28,7
Tashlak	2022	19763	16009	920	4,6	862	5,4
	2021	24795	19527	732	2,9	699	3,5
Uzbekistan	2022	54411	43659	1941	3,6	1933	4,4
	2021	42249	32386	1204	2,8	1179	3,6
Uchkuprik	2022	58761	39079	2816	4,8	2727	6,9
	2021	58 256	41149	3032	5,2	2970	6,6
Fergana	2022	62052	36845	16010	2,6	1522	4,1
	2021	49259	36449	1498	3,0	1380	3,7
Furkat	2022	30690	22635	1153	3,7	1141	5,0
	2021	29613	22907	1402	4,7	1374	5,9
Yazyavan	2022	26477	17637	1256	4,7	1237	7,0
	2021	23 212	15 760	1 411	6,0	1 379	8,7
Total	2022	786 382	557 539	35 300	4,5	33 726	6,0
	2021	686970	485395	35182	5,1	33086	6,8

Enterobiasis and hymenolepidosis are widespread, both in urban and rural areas. Foci of ascariasis are registered in the mountain-foothill zones of the Fergana region, for example, in the Sukhsy district in 2021, out of 7857 surveyed, 525 (6.7%) patients affected by ascariasis were identified, of which 497 (17.4%) were children under 14 years of age, and in 2022, out of 10,575 surveyed, 627 (5.9%) patients affected by ascariasis were identified, of which 603 (12.5%) were children under 14 years of age.

Discussion. Uzbekistan is one of the regions where echinococcosis is endemic, and in recent years there has been a clear trend towards an increase in the incidence of echinococcosis in the republic. For example, in the Fergana region in 2021, out of a total of 686,970 surveyed, 43 (1.1%) patients with echinococcosis were identified, of which 4 (0.2%) were children under 14 years of age, and in 2022, out of a total of 786,382 surveyed, 61 were identified. (2.0%) patients with echinococcosis, of which 12 (1.0%) are children under 14 years of age. In some preschool institutions and schools, the infestation of children with the most common parasites in our region - *Enterobius vermicularis*, *Hymenolepis nana*, *Lamblia intestinalis* is 30-35%. So, if in 2021 the incidence rate per 100,000 population was 4.5, then in 2022 it will be 5.1.

Due to the high population density, large number of animals and a significant degree of their infection with helminths, the biological load on environmental objects in the populated areas of the region will be intense, therefore, at the next stage of work, we investigated helminthic contamination of the soil in the Fergana region. In populated areas of the region, 61.21% of the studied objects and 52.21% of soil samples were contaminated with propagative stages of helminths. The intensity of soil seeding was 42.4 ± 28.6 specimens/kg. In none of the control soil samples taken in areas remote from populated areas and, therefore, experiencing less anthropopressure, propagative stages of helminth development were found, which confirms the idea that in urbanized areas there is a process of intensification of parasitic environmental pollution.

Due to insufficient identification of patients, the necessary anti-epidemic measures are carried out only in one outbreak of the disease out of three existing ones. Thus, analyzing the current situation regarding the prevalence and clinical manifestations of parasitoses, we can note a certain role of helminthiasis and parasitosis in the formation of background conditions in children.

Among the patients, 90% are children, mainly aged 1 to 3 years. Widespread prevalence, a chronic course associated with the long-term presence of the pathogen in the patient's body, which is determined not only by the lifespan of the parasite, but by frequent reinfestations, is the main feature of most parasitic diseases. Especially in childhood, parasitic diseases are a common cause of anemia, and also lead to various forms of acquired immunodeficiency associated with a decrease in the immune response of the T-immune system to any antigens. Even in the absence of clinical symptoms, the development of a secondary immunodeficiency state has been noted with intestinal parasitosis [4]. Helminth infections in children, as a rule, are accompanied by a variety of nonspecific clinical manifestations: allergic diseases - 107 (71.3%), gastrointestinal dysfunction - 113 (75.3%), abdominal pain syndrome - 60 (40%), appetite disorders - 66 (44%), bruxism (teeth grinding) - 25 (16.7%), night sleep disturbances - 81 (54%), anal excoriation or itching - 54 (36%), immune disorders - 29 (19.3%), other symptoms - 49 (32.7%).

Observations show that the presence of parasites in the body does not always manifest itself with specific clinical symptoms. The gradual and long-term allergic effect of the parasite's metabolic products and the suppression of the host's immunity create the preconditions for a decrease in the body's resistance and the development of infectious diseases. In addition, it has been proven that young children with helminthic infestation are more often susceptible to other infectious diseases, which is associated with a significant decrease in the body's overall resistance and nutritional disorders [4].

Helminthiasis of agricultural and domestic carnivorous animals have an important feature - unlike other parasitoses, they occupy the entire territory of the Fergana region. Therefore, almost the entire population of domestic animals should be considered as a group at increased risk of infection with helminths and a constant source of environmental pollution by their propagative stages. It is important that 17 species of helminths out of those registered in agricultural and domestic carnivores in the Fergana region pose a biological hazard to humans. Among them, the most important are such pathogens of anthrozooses as *E. granulosus*, *T. saginatus*, *T. solium*, *T. spiralis*, *A. suum*, species of the genera *Toxocara*, *Strongiloides*, family *Ancylostomatidae*. The soil is most intensively contaminated with helminth eggs of the *Nematoda* class.

We conducted studies of the seasonal dynamics of soil biosafety. In soil samples taken in the spring, we noted the largest absolute number of propagative stages of helminths, the largest absolute and relative

number of immature eggs. This indicates that during the cold season, the preservation and accumulation of propagative stages of helminths occurred, but not their development. In the summer, we noted a decrease in the absolute number of helminth eggs by 25.79%, and an increase in the proportion of deformed eggs. This indicates that summer is a period of soil remediation from invasive beginnings under the influence of abiotic (ultraviolet radiation, high temperature, low soil moisture) and biotic factors.

The soil of settlements in the Fergana region is characterized by a high degree of helminthic contamination: the extensiveness was 64.45%, the intensity was 42.4 ± 28.6 specimens/kg. The soil is most contaminated with eggs of representatives of the class Nematoda, and to a lesser extent - oncospheres of representatives of the class Cestoda. Eggs of representatives of the class Trematoda were observed least often.

The soil of the territory of individual households and kindergartens is most susceptible to helminthic contamination - the extensiveness of infestation of individual households was 90.33%, intensity - 116.5 ± 45.1 specimens/kg; kindergartens - 25.71% and 19.4 ± 2.7 specimens/kg, respectively. The extent of soil contamination in schools was 15.56%, intensity - 21.3 ± 6.8 specimens/kg. The extent of infestation in courtyards of communal households was 5.77%, intensity - 12.5 ± 2.9 specimens/kg.

Conclusions. In the soil of urban areas, less helminth faunal diversity was observed than in the soil of rural settlements. The extent of soil contamination in the territory of urban preschool institutions was 3.2 times higher than in rural ones (40% and 12.5%, respectively). The extent of soil contamination of individual households in urban areas was 1.5 times lower than in rural areas (60% and 91.23%, respectively), the intensity was 4.2 times lower (28.3 ± 1.0 and 118.4 ± 44.0 specimens/kg). All cases of helminth contamination of soil in school areas were noted in rural settlements.

The seasonal dynamics of soil contamination by propagative stages of helminth development have been revealed. The degree of helminthic soil contamination decreases from spring to autumn: in summer - by 25.79%, compared to the spring period, in autumn - by 38.13%, compared to the summer period. Due to the constant presence of helminth eggs containing active larvae in the soil, infection of the region's population with helminth infections is possible from mid-April to mid-November.

Thus, qualitative and quantitative indicators of helminth infestation of animals in the Fergana region are real indicators of biological danger not only for agricultural and domestic carnivores, but also for humans.

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